CITY OF EMIDA (PWSNO 1050009)
SOURCE WATER ASSESSMENT REPORT

March 24, 2003

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This risk assessment is based on a land use inventory in the well recharge zone, sensitivity factors associated with how the well was constructed, and aquifer characteristics.

This report, *Source Water Assessment for the City of Emida*, describes the public drinking water well; the well recharge zone and potential contaminant sites located inside the recharge zone boundaries. This assessment, taken into account with local knowledge and concerns, should be used as a planning tool to develop and implement appropriate protection measures for this public water system. **The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

The City of Emida operates community water system with 37 active connections serving a population of 200 in rural Benewah County Idaho. A 65-foot deep well pumping from a basalt aquifer supplies drinking water for the community. Historically, City of Emida has had few water quality problems other than the detection of the volatile organic chemical chloromethane in a sample tested in October 1999. A ground water susceptibility analysis conducted by The Idaho Department of Environmental Quality on January 29, 2003 ranked the well highly susceptible to volatile organic chemical contamination. The risk relative to other classes of regulated contaminants is low.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

Operating and maintaining the well in compliance with the *Idaho Rules for Public Drinking Water Systems* is one of the most effective drinking water protection tools available to the City of Emida. The city should have a written water emergency response plan. The emergency response plan and the city's maintenance and testing schedule should be reviewed periodically and updated as needed. The city should involve the public in drinking water protection by distributing educational materials showing how everyday activities can be changed to reduce their potential for ground water contamination.

Due to the time involved with the movement of ground water, source water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. For assistance in developing protection strategies, please contact your regional Department of Environmental Quality office or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR CITY OF EMIDA

Section 1. Introduction - Basis for Assessment

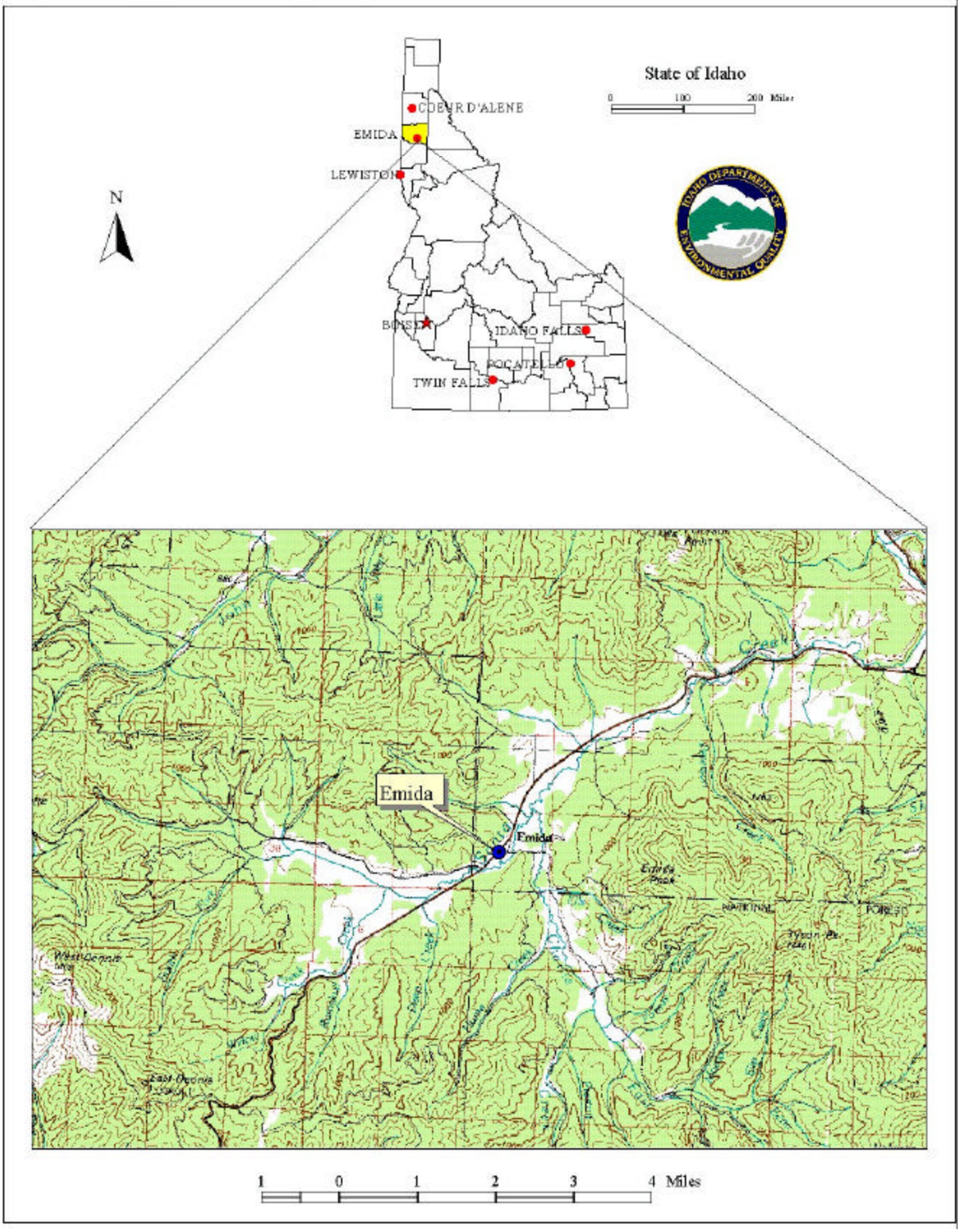
The following sections contain information necessary for understanding how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and an inventory of significant potential sources of contamination identified within that area are included. The ground water Susceptibility Analysis Worksheet used to develop this assessment is attached.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess every public drinking water source in Idaho for its relative susceptibility to contaminants regulated by the Safe Drinking Water Act. These assessments are based on a land use inventory inside the delineated recharge zones, sensitivity factors associated with how the well is constructed, and aquifer characteristics. The state must complete more than 2900 assessments by May of 2003. Because resources and the time available to accomplish assessments are limited, an in-depth, site-specific investigation for every public water system is not possible.

The results of the source water assessment should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system. The ultimate goal of this assessment is to provide data to local communities for developing a protection strategy for their drinking water supply. The Idaho Department of Environmental Quality recognizes that pollution prevention activities generally require less time and money to implement than treating a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a source water protection program should be determined by the local community based on its own needs and limitations. Wellhead or source water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Figure 1. Geographic Location of the City of Emida



Section 2. Preparing for the Assessment

Defining the Zones of Contribution -

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the well recharge area into time of travel zones indicating the number of years necessary for a particle of water flowing through the aquifer to reach a well. The computer model used data assimilated by DEQ from a variety of sources including the local well logs and pumping volume estimates for the City of Emida well.

The City of Emida operates a community water system with 37 active connections serving a population of 200 in rural Benewah County Idaho (Figure 1). A 65-foot deep well completed in basalt supplies drinking water for the community. The estimated capacity of the well is 27 gallons per minute. The ground water flow model WhAEM2000 was used to delineate 3-, 6-, and 10-year capture zones for the Emida well.

Initial estimates of hydraulic conductivity and aquifer thickness were based on well logs and specific capacity data. The initial estimates of model parameters and boundaries were adjusted as necessary to best replicate observed water-level measurements. Because of the inherent uncertainty in ground water modeling the input parameters were varied to evaluate the effect on capture zone geometry. In some cases, the final capture zone was a composite of the various simulations run for each model.

The extent of the water producing basalt the Emida well draws from was determined along Santa Creek and Charlie Creek using surficial geologic maps and local well logs. The extent of the basalt was used as the no flow boundary for the model simulations. Hydraulic conductivity was varied from 10 to 50 feet per day, the aquifer thickness was varied from 20 to 50 feet, porosity was set at 0.1, and recharge was varied from 0.22 inches per year to 0.8 inches per year to match the available test points. The resulting delineation is shown in Figure 2.

Identifying Potential Sources of Contamination

The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Inventories for all public water systems in Idaho were conducted in two-phases. The first phase involved identifying and documenting potential contaminant sources within a system's source water assessment area through the use of computer databases and Geographic Information System maps developed by DEQ. Maps showing the delineations and tables summarizing the results of the database search were then sent to system operators for review and correction during the second or enhanced phase of the inventory process. Information from the public water system file was also incorporated into the potential contaminant inventory.

Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. When a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation.

Section 3. Susceptibility Analysis

The susceptibility to contamination of all ground water sources in Idaho is being assessed on the following factors:

- physical integrity of the well,
- hydrologic characteristics,
- land use characteristics, and potentially significant contaminant sources
- historic water quality

The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. A high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. The following summaries describe the rationale for the susceptibility ranking. The Susceptibility Analysis Worksheet for the City of Emida well, Attachment A, shows in detail how the well was scored.

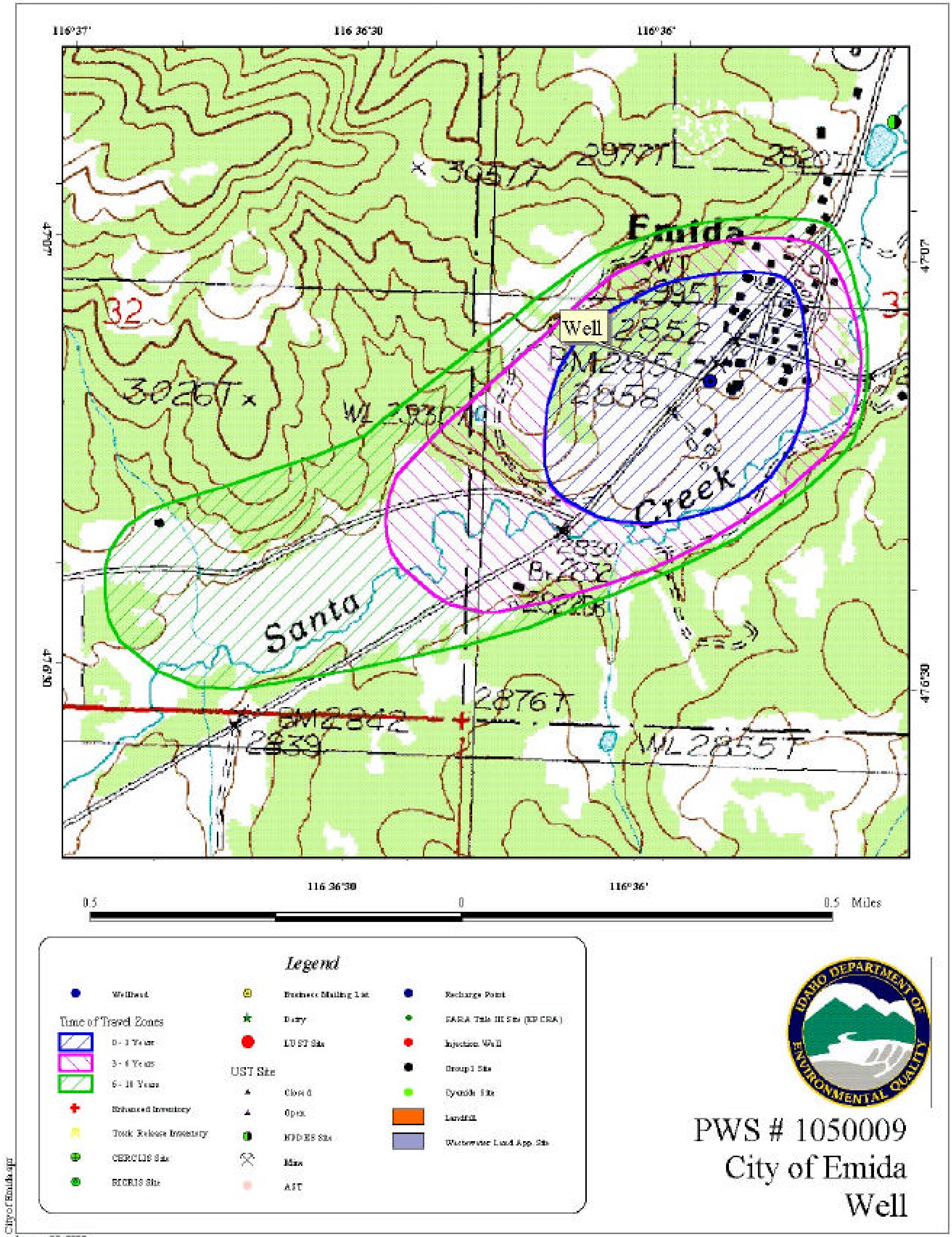
Well Construction

Well construction directly affects the ability of the wells to protect the aquifer from contaminants. Lower scores imply a well that can better protect the water. This portion of the susceptibility analysis relies on information from individual well logs and from the most recent sanitary survey of the public water system. The City of Emida well log is on file with DEQ. Correspondence in the Public Drinking Water System file for the City of Emida indicates that deficiencies noted during a sanitary survey in October 1999 were corrected the following April.

The Emida well was drilled in 1983. The 6-inch steel casing terminates 40 feet below the surface at the interface between a deep clay bed and the underlying basalt. The portion of the well bore from 40 to 65 feet is free standing in basalt. The well log reports a 20-foot deep surface seal. The static water level is 38 feet below land surface. When air tested at the time of drilling the well produced 27 gallons per minute. Except for a minor difference in the casing wall thickness, the well meets current Idaho Department of Water Resources well construction standards.

The well is located about 250 feet south of Santa Creek and is above the flood plain. A site inspection and review of the well's bacterial sampling history in October 1999 determined that the well is not surface water influenced.

Figure 2. City of Emida Delineation and Potential Contaminant Inventory.



Hydrologic Sensitivity

Hydrologic sensitivity scores reflect natural geologic conditions at the well site and in the recharge zone. Information for this part of the analysis is derived from individual well logs and from the soil drainage classification inside the delineation boundaries. The City of Emida well scored 3 points out of 6 points possible in the hydrologic sensitivity portion of the susceptibility analysis. Soils in the recharge zone generally are poorly drained to moderately well drained. Soils that drain slowly are deemed more protective of ground water than rapidly draining soils. At the well site, 2 feet of topsoil and 38 feet of clay cover the water producing basalt that extends from 40 to 65 feet below the surface.

Potential Contaminant Sources and Land Use

Figure 2, *City of Emida Delineation and Potential Contaminant Inventory* on page 7 shows the location of the City of Emida well, and the zone of contribution DEQ delineated for it. The town of Emida lies inside the 0-3 and 3-6 year time of travel zones. Residential land use is the only potential source of contaminants documented inside the recharge zone. Most of the area outside of the town is undeveloped forest.

Historic Water Quality

City of Emida has had few water quality problems other than the presence of the volatile organic chemical chloromethane in a sample tested in November 1999. With no other volatile organic test results available, it is not possible to determine whether the 1999 detection represents contamination of the aquifer. Chloromethane can be a by-product of chlorination. Other sources of the chemical are vinyl chloride waste, cigarette smoke, polystyrene insulation, and aerosol propellants. It is also used as an herbicide, solvent, and fumigant.

In the period from January 1998 through December 2002, monthly tests for total coliform bacteria were positive in April 2001 and October 2002. Total coliforms were absent from all other samples tested. The system has occasionally failed to monitor as required. No treatment of the water is provided. Chemical and radiological sampling results for Emida are summarized on the table below.

Table 1. City of Emida Chemical Sampling Results

Primary IOC Contaminants (Mandatory Tests)							
Contaminant	MCL (mg/l)	Results (mg/l)	Dates	Contaminant	MCL (mg/l)	Results (mg/l)	Dates
Antimony	0.006	ND	7/26/95, 11/30/99	Nitrate	10	ND to 0.35	11/6/84 through 11/15/01
Arsenic	0.01	ND	11/6/84 through 9/24/02	Nickel	N/A	ND	11/30/99
Barium	2.0	ND	11/6/84 through 11/30/99	Selenium	0.05	ND	11/6/84 through 11/30/99
Beryllium	0.004	ND	7/26/95, 11/30/99	Sodium	N/A	8.26 to 9.0	11/6/84 through 9/24/02
Cadmium	0.005	ND	11/6/84 through 11/30/99	Thallium	0.002	ND	7/26/95, 11/30/99
Chromium	0.1	ND	11/6/84 through 11/30/99	Cyanide	0.02	ND	7/26/95, 11/30/99

Table 1. City of Emida Chemical Sampling Results continued

Primary IOC Contaminants (Mandatory Tests)							
Contaminant	MCL (mg/l)	Results (mg/l)	Dates	Contaminant	MCL (mg/l)	Results (mg/l)	Dates
Mercury	0.002	ND	11/6/84 through 11/30/99	Fluoride	4.0	ND to 0.2	11/6/84 through 11/30/99

Secondary and Other IOC Contaminants (Optional Tests)			
Contaminant	Recommended Maximum (mg/l)	Results (mg/l)	Dates
Sulfate	250	2.27, 26.9	7/26/95, 11/30/99

Regulated and Unregulated Synthetic Organic Chemicals		
Contaminant	Results	Dates
29 Regulated and 13 Unregulated Synthetic Organic Compounds	None Detected	11/30/99

Regulated and Unregulated Volatile Organic Chemicals		
Contaminant	Results	Dates
21 Regulated And 16 Unregulated Volatile Organic Compounds	None Detected except as noted below	11/30/99
Chloromethane	2.21 µg/l	11/30/99

Radiological Contaminants			
Contaminant	MCL	Results	Dates
Gross Alpha, Including Ra & U	15 pC/l	1.2, 0.1	11,6,84, 4/26/00
Gross Beta Particle Activity	4 mrem/year	2.7, 2.9 mrem	4/26/00, 11/6/84

Final Susceptibility Ranking

The City of Emida well was automatically ranked highly susceptible to volatile organic chemical contamination because of the detection of chloromethane in a samples tested in October 1999. The well is at low risk relative to inorganic, synthetic organic and microbial contaminants. Most of the well recharge zone outside of Emida is undeveloped forest with few potential contaminant sites inside its boundaries. The well itself appears to be adequately constructed and maintained, and it is located in an area where deep clay soils provide some protection against the vertical transport of contaminants. Total scores for system construction and hydrologic sensitivity along with the cumulative scores for land use and potential contaminant sites are shown on Table 2. The complete Susceptibility Analysis Worksheet for the City of Emida well can be found in Attachment A.

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)
2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.35)

The final ranking categories are as follows:

- 0 - 5 Low Susceptibility
- 6 - 12 Moderate Susceptibility
- > 13 High Susceptibility

Table 2. Summary of City of Emida Susceptibility Evaluation

Cumulative Susceptibility Scores						
Well Name	System Construction 0-6 possible	Hydrologic Sensitivity 0-6 possible	Contaminant Inventory plus Land Use			
			IOC 0-30 possible	**VOC** 0-30 possible	**SOC** 0-30 possible	**Microbial** 0-14 possible
Well #1	1	3	7	7	7	3

Final Susceptibility Scores/Ranking				
Well Name	IOC 0-18 possible	VOC 0-18 possible	SOC 0-18 possible	Microbial 0-15 possible
Well #1	5/Low	*High	5/Low	5/Low

Low numbers are favorable because high scores indicate increased susceptibility to contaminants
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical
*High due to presence of chloromethane in tested water.

Section 4. Options for Source Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

Since chloromethane is found in many commonly used products, its presence in the water sample tested in 1999 may have been due to contamination of the sampling container or tap. Future VOC testing will show if the chemical's presence was an isolated error or is an on going problem. In the meantime, the system operator can review maintenance practices and products for their potential for accidentally contaminating water system components.

It might be helpful to distribute public education materials along with water bills. Brochures about vehicle maintenance for example are readily available. Automotive maintenance products contain many volatile organic chemicals that can pollute ground water if they are used and disposed of improperly. The city could sponsor household hazardous waste collection days to encourage disposal methods other than dumping or flushing these potential contaminants.

A voluntary measure every system should implement is development of a water emergency response plan. There is a simple fill-in-the-blanks form available on the DEQ website to guide systems through the process.

Due to the time involved with the movement of ground water, wellhead protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term.

Assistance

Public water suppliers and users may call the following IDEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the IDEQ office for preliminary review and comments. Water suppliers serving fewer than 10,000 persons may contact Melinda Harper, Idaho Rural Water Association (208)343-7001 for assistance with drinking water protection strategies or on their website www.idahoruralwater.com

Idaho Department of Environmental Quality

Coeur d'Alene Regional IDEQ Office	(208) 769-1422
State IDEQ Office, Boise	(208) 373-0502
Website:	http://www.deq.state.id.us/

Idaho Rural Water Association

Melinda Harper, Groundwater Protection Specialist	(800) 962-3257
Website:	http://www.idahoruralwater.com

Idaho Association of Soil Conservation Associations

Water quality and soil conservation	(208) 338-5900
Website:	http://www.iascd.state.id.us/

References Cited

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Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 1997. "Recommended Standards for Water Works."

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Idaho Department of Water Resources, 1993. Administrative Rules of the Idaho Water Resource Board: Well Construction Standards Rules. IDAPA 37.03.09.

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Attachment A

City of Emida
Susceptibility Analysis Worksheet

Ground Water Susceptibility

Public Water System Name : **EMIDA CITY OF** Source: **WELL #1**

Public Water System Number : **1050009** 1/29/03 10:58:37 AM

1. System Construction		SCORE			
Drill Date	5/83				
Driller Log Available	YES				
Sanitary Survey (if yes, indicate date of last survey)	YES 1999				
Well meets IDWR construction standards	YES	0			
Wellhead and surface seal maintained	YES	0			
Casing and annular seal extend to low permeability unit	YES	0			
Highest production 100 feet below static water level	NO	1			
Well located outside the 100 year flood plain	YES	0			
Total System Construction Score		**1**			
2. Hydrologic Sensitivity					
Soils are poorly to moderately drained	YES	0			
Vadose zone composed of gravel, fractured rock or unknown	NO	0			
Depth to first water > 300 feet	NO	1			
Aquitard present with > 50 feet cumulative thickness	NO	2			
Total Hydrologic Score		**3**			
3. Potential Contaminant / Land Use - ZONE 1A (Sanitary Setback)		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	Suburban	1	1	1	1
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	YES. Chloromethane	NO	YES	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		**1**	**1**	**1**	**1**
Potential Contaminant / Land Use - ZONE 1B (3 YR. TOT)					
Contaminant sources present (Number of Sources)	YES. Residential area	1	1	1	1
(Score = # Sources X 2) 8 Points Maximum		2	2	2	2
Sources of Class II or III leacheable contaminants or Microbials	YES	1	1	1	
4 Points Maximum		1	1	1	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		**3**	**3**	**3**	**2**
Potential Contaminant / Land Use - ZONE II (6 YR. TOT)					
Contaminant Sources Present	YES. Residential area	2	2	2	
Sources of Class II or III leacheable contaminants or Microbials	YES	1	1	1	
Land Use Zone II	Less than 25% Agricultural Land	0	0	0	
Potential Contaminant Source / Land Use Score - Zone II		**3**	**3**	**3**	**0**
Potential Contaminant / Land Use - ZONE III (10 YR. TOT)					
Contaminant Source Present	NO	0	0	0	
Sources of Class II or III leacheable contaminants or Microbials	NO	0	0	0	
Is there irrigated agricultural lands that occupy > 50% of Zone	NO	0	0	0	
Total Potential Contaminant Source / Land Use Score - Zone III		**0**	**0**	**0**	**0**
Cumulative Potential Contaminant / Land Use Score		**7**	**7**	**7**	**3**
4. Final Susceptibility Source Score		**5**	**5**	**5**	**5**
5. Final Well Ranking		Low	***High**	Low	Low

*High due to detection of VOC in tested well water.

POTENTIAL CONTAMINANT INVENTORY
List of Acronyms and Definitions

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as ? Superfund? is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RICRIS – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water assessment area.